and selection were higher in high malaria transmission areas as compared to low malaria transmission areas. The data reported here will be important for the development of AMA1-based malaria vaccine.

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47.003

Point Mutations in Pfcrt (K76t) and Pfmdr (N86y) Genes of *P. falciparum* and *in vivo* Responses of Chloroquine Among Malaria Patients Sennar, Sudan

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Chloroquine resistance in *P. falciparum* has been associated with specific mutations in the Pfcrt and Pfmdr-1 genes. In this study, 66 patients aged (1—65 years) with uncomplicated falciparum malaria in Sudan, were examined to assess the association between the mutations and clinical outcome. *In vivo* method was used according to WHO (1996) protocol and PCR-RFLP was used to detect point of mutations. The results showed that 48 (72.7%) were sensitive to Chloroquine and successfully treated, failure was observed in 18 (27.3%). R1, R11 & R111 levels of resistance were detected, while PCR-RFLP analysis revealed the presence of mutant T76 allele in 42 (63.6%) isolates. The remaining 24 (36.4%) isolates carried the wild type (K76) allele and no mixed alleles were found. The Pfmdr1 (Tyr-86) was found in 33 (50%) isolates, while 26 (39.4%) isolates carried (Asn-86) wild type, and 7 (10.6%) isolates had mixed infection (Tyr-86 plus Asn-86). The data showed that the allele of the Pfcrt gene with K76T is strongly associated with chloroquine resistance, while there is no association between Pfmdr -1 gene and chloroquine in vivo test, further studies are needed to assess the drug resistance in other regions of intense transmission.

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47.004

Apoptosis Stalks an Exponentially Growing *Plasmodium falciparum* Culture

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Plasmodium cell-death is mediated by a number of proteases, including metacaspase and the recently described apoptosis related protein (PfARP). However, the components of apoptotic machinery in the blood stages of *P. falciparum* have not been explored largely because the asexual forms are obligatory intra-erythrocytic unlike the vector stages that can exist freely. In this paper we traced the process of apoptosis in an exponentially growing *P. falciparum* culture. Synchronized cultures were initiated at a parasitemia of 0.8% and maintained under conditions that were not limiting for red blood cells and nutritently crashed when the growth requirements were not limiting. The following apoptotic processes were evaluated at every stage of the growth: Calcium re-distribution by Fluo-4/AM calcium indicator, mitochondrial membrane potential collapse by TMRE (Tetramethylrhodamine, ethyl ester) and DNA fragmentation by TUNEL (terminal deoxynucleotidyl transferase-mediated dUTP nick-end labeling). Blotted membranes were probed with polyclonal antibodies to PfARP and human caspase. Although these apoptotic features were highest just before the cultures crashed, they were expressed to varying levels at each parasite density >2%. These findings suggest existence of quorum sensing mechanisms that allow malaria parasites to auto regulate their density even when the growth requirements are not limiting.

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47.005

A Study of Atypical Manifestations of Vivax Malaria

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Background: Life threatening complications like renal failure, cerebral malaria, thrombocytopenia etc. are classically described in *falciparum* malaria. However, as there were few reports in literature of such complications in vivax malaria, this study was undertaken to assess the atypical manifestations of vivax malaria.

Methods: This study was conducted in an University hospital at Manipal, located in South India. Adult patients who were smear positive for vivax malaria were included in the study. Their clinical presentations, laboratory parameters and response to therapy were assessed. Mixed infection and infection due to other species of malaria were excluded.

Results: A total of 110 patients were included in the study. All patients presented with fever, however typical tertian fever was not commonly noted. Examination revealed jaundice in 14 patients and hypotension in 9 patients at admission. Anaemia (<12 gms%) was found in 59 patients. Thrombocytopenia (less than 150,000/cumm) was the commonest laboratory abnormality, being noted in 88 patients and among them 14 had platelet count of < 50,000/cum. Serum bilirubin of >2 mg/dl was noted in 22 patients. 39 patients had elevated transaminases. Twelve patients had abnormal renal function, all of them recovered with appropriate hydration and primary antimalarial therapy. Among 100 patients treated with Chloroquine, 99 responded adequately. Ten patients were given antimalarials other than Chloroquine suspecting mixed infection at admission. No mortality was observed.

Conclusions: Vivax malaria can often manifest like complicated *falciparum* malaria. Thrombocytopenia was the commonest abnormality noted in this study, though clinical bleeding was not observed. Other complications like renal failure and hypotension were also noted. Satisfactory response to Chloroquine and nil mortality observed in this study are encouraging points. Hence correct identification of the species in a patient with complicated malaria is very